

PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) IMPROVEMENTS IN OR RELATING TO WASHING AND SPIN-DRYING

5 (71) We, GEBR. POENSGEN GMBH, a German Company, of Bochumer Strasse 45, 4, Dusseldorf-Rath, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to a method of and a machine for washing and spin-drying so that unbalance in spin-drying of washing in a washing and spin-drying machine in which washing is performed is reduced.

15 As a rule, large washing and spin-drying machines have horizontal drum axes which retain their horizontal position during the washing cycle and during the spin-drying cycle. By contrast, washing and spin-drying machines whose axis of rotation can be tilted from a substantially horizontal into a substantially vertical position and *vice versa* have substantial advantages. With this type of washing and spin-drying machine, washing is performed with the axis of rotation substantially horizontal, while spin-drying is performed with the axis of rotation substantially vertical, at a correspondingly higher rotational speed.

20 An object of the invention is to provide a method for washing and spin-drying machines with a tiltable axis of rotation by means of which it is possible to reduce the unbalance of the washing which normally occurs in spin-drying. The normal filling ratio of a rotating drum with washing during the washing cycle is normally 1:12 to 1:14 while a conventional spin drying filling ratio is approximately 1:5 during charging and approximately 1:7 during floating-in of the washing. The rotating drum of the washing and spin-drying machine is therefore underloaded during the spin-drying operation. A greater amount of unbalance occurs in underloaded spin-drying machines than in a fully laden spin-drying machine, because in a fully laden spin-drying machine it is impossible, or at least nearly

so, for unbalance to occur, owing to the fullness of the charge.

According to one aspect of the present invention there is provided a method of washing and spin-drying in a washing and spin-drying machine, which comprises washing the washing in a rotating drum of the machine whilst the axis of rotation of drum is substantially horizontal, slowly pivoting the axis of rotation of the drum rotating at the washing speed to a substantially vertical spin-drying position while increasing the amount of liquor in the drum, so that the washing is substantially uniformly distributed for a spin-drying operation, and thereafter spin-drying the washing by accelerating the speed of rotation of the drum.

25 According to a second aspect of the invention there is provided a washing and spin-drying machine suitable for carrying out the method described in the preceding paragraph comprising a rotatable drum in which washing can be washed while the axis of rotation of the drum is substantially horizontal, means for slowly pivoting the axis of rotation of the drum rotating at the washing speed after washing of the washing to a substantially vertical spin-drying position, means for increasing the amount of liquor in the drum while the rotational axis of the drum is pivoted and means for thereafter spin-drying the washing by accelerating the speed of rotation of the drum. Preferably the drum is rotatable in a housing which is pivotable therewith through at least 90° about a horizontal pivoting axis of rotation, the rotatable drum and the housing being rigidly supported in a frame, which is pivotable about a horizontal pivoting shaft, and the pivoting shaft being supported by pendulum columns, preferably four, each having a resilient buffer suspension.

Clearly, this invention is not limited to the washing with water of soiled laundry, but is applicable to the treatment of any solid

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materials by immersing in liquor and there-
after removing the liquor.

5 The afore-mentioned features of the in-
vention provide the substantial advantage that
the unbalance is reduced owing to the uniform
distribution of the washing during the spin-
drying operation. Under these circumstances,
10 it is important for the washing to float by
virtue of the increasing rinsing liquor (norm-
ally water) level. The rotating drum assumes
the upright position at the washing speed.
15 Owing to the higher liquid level the wash-
ing bears uniformly over the entire surface
of the rotating drum shell by contrast to the
aforementioned type of machine, in which
relatively small amount of water will be in
20 the rotating drum so that the washing is dis-
posed packed in a thick layer in the lower
part of the rotating drum and the centrifug-
ing or spin-drying effect cannot become fully
effective.

A further advantage of the invention is
25 that after spin-drying the washing can be re-
moved from the rotating drum more readily
than in the aforementioned type of machine
since it is distributed in a thin layer of wash-
ing over the entire surface of the rotating
drum. There is a further advantage in that
the washing normally has only an exception-
30 ally small residual liquor (normally moisture)
content after the spin-drying operation.

According to a further embodiment of the
invention it is proposed that acceleration of
35 the rotational speed of the rotating drum for
the spin-drying operation begins at the end
of the motion for uprighting the axis of rota-
tion of the rotating drum, the changeover
from the washing speed to the spin-drying
40 speed taking place while the direction of rota-
tion of the rotating drum is continued as at
the beginning of the accelerating phase.
Acceleration of the rotational speed may be-
gin either briefly before or briefly after the
45 end of uprighting by changing over the rota-
tional speed of the washing operation into that
of the spin-drying operation. A special ad-
vantage is the favourable kind of speed
change from the washing to the spin-drying
50 operation. It is known that the washing or
rinsing operation is performed at a revers-
ing cycle. It was found that the washing does
not readily bear uniformly against the internal
shell of the drum if the centrifuging process
55 is started immediately after a reversing cycle.
By contrast, very much smaller unbalances
are created if the direction of rotation of
the last rinsing cycle is retained while
acceleration into the spin-drying operation
60 takes place at the same direction of rotation.
Accordingly, the beginning of acceleration for
spin-drying is not left to chance but should
be deliberately related to the reversing cycle.

According to a further proposal of the in-
vention, the rinsing liquor is drained off after
65 the rotation speed of the rotating drum be-

gins to be accelerated. This procedure also im-
proves the manner in which the washing bears
upon the internal shell of the rotating drum
and thus encourages de-liquoring.

70 The method according to the invention en-
sures that in spin-drying with a vertical axis
of rotation of the rotating drum the spin-dry-
ing operation proceeds uniformly, particu-
larly if the drum is undivided. In the last
75 mentioned case, weighing of the washing is
not required.

It has been found advantageous for the
amount of rinsing liquor to be approximately
80 doubled when the axis of rotation of the rotat-
ing drums begins to be pivoted from its sub-
stantially horizontal washing position into its
substantially vertical spin-drying position.
This ensures optimum and uniform distribu-
tion of the washing in the rotating drum
85 while avoiding an unnecessarily large amount
of rinsing liquor.

By virtue of the preferred construction of
the bearing system and support system of the
rotation drum and housing, the disadvantages
90 and defects of tiltable washing and spin-dry-
ing machines are eliminated or at least miti-
gated. The disadvantages and defects are
mainly due to the uncertainty and instability
of the housing suspension and therefore of
95 the rotating drum and is therefore not suit-
able to absorb mass forces resulting from
unbalance and which may become very large,
in particular at high rotational speeds during
spin-drying. These disadvantages and defects
100 do not occur in at least the preferred wash-
ing and spin-drying machine according to the
invention due to its novel and advantageous
construction.

For a better understanding of the invention
and to show how the same may be carried
105 into effect, reference will now be made, by
way of example, to the accompanying draw-
ings, in which:

Figure 1 shows a cross-section of a wash-
ing and spin-drying machine according to
110 the invention in the loading and spin-drying
position,

Figure 2 shows a side elevation of the
machine of figure 1 in the direction of the
115 arrow A,

Figure 3 shows a side elevation of the
machine of figure 1 in the direction of the
arrow A in the washing position,

Figure 4 shows a partial sectional side ele-
vation in the direction of the arrow A of the
120 rotating drum with the housing of the machine
of figure 1 in the unloading position, and

Figure 5 shows sectional side elevation of
the machine of figure 1 in the loading posi-
125 tion, with the washing part divided into a
clean and unclean side by means of a separa-
ting wall.

Referring now to the drawings, a washing
and spin-drying machine 10 is provided with
130 a rotating drum 12 in a housing 11. The

housing 11 and the rotating drum 12 can be closed at the top by a cover 13. The rotating drum 12 is supported by a spin-drying motor 14 on whose shaft 15 drum base 12a is mounted. The spin-drying motor 14 is mounted on a rolling plate 16 which is pivotably journalled about a horizontal pivoting shaft 17. The horizontal pivoting shaft 17 in turn is supported relative to the floor by means of four pendulum columns 18, each of which has a resilient buffer suspension 19.

The rolling plate 16 also retains a washing motor 20, which drives the rotating drum 12, via a reduction transmission 21, during the washing cycle. A tilting motor 22 tilts the rotating drum 12 by means of a worm transmission 23 from the loading and centrifuging position (as shown in figures 1 and 2) into the washing position (figure 3) or into the unloading position E (figure 4). The horizontal pivoting shaft 17 is disposed perpendicularly to the axis of rotation 24 of the rotating drum 12. The centre of gravity 25 of the rotating drum 12 is disposed approximately at the level of the horizontal pivoting shaft 17. The axis of rotation 24 of the rotating drum 12 can be pivoted downwardly from the vertical position (figures 1 and 2) through more than 90°, preferably through 120° (figure 4) for the purpose of unloading the washing. In the washing position (figure 3) the axis of rotation 24 and, therefore, the rotating drum 12 is pivoted through 90° relative to the vertical spin-drying position (figures 1 and 2).

The pivoting shaft 17 is advantageously constructed as a hollow shaft. As can be seen from figure 1, it may serve on the left-hand side for supplying steam and on the right-hand side for supplying water and detergent from a storage vessel 26.

If a laundry is subdivided by means of a separating wall 28 of a machine as shown in figure 5 into a clean side R and into an unclean side U, the washing machine itself will be disposed on the clean side R. The separating wall 28 is provided with a pivoting frame 30 journalled thereon by means of a hinge 29. During pivoting motion, the free end of the pivoting frame 30 sealingly bears upon an extension 28a of the separating wall 28, said extension being constructed in the form of a circular sector. The pivoting frame 30 is provided with an extension neck 31 and a cover 32 which can close the extension neck 31 which represents a filling socket. In the washing, spin-drying and unloading position the cover 32 is closed and the pivoting frame 30 is disposed approximately vertically. In the loading position the pivoting frame 30 is pivoted in the direction of the arrow 34 until the extension neck 31 bears on the opened loading aperture 33 of the washing machine in the loading position B thereof. In the loading position B, the

axis of rotation 24 of the rotating drum 12 is pivoted from its vertical position through more than 270° or less than 90°, preferably by 290° or 70°, respectively, in the embodiment shown in figure 5. After unloading from its unloading position, E, the machine is appropriately further pivoted into the loading position B according to figure 5.

WHAT WE CLAIM IS:—

1. A method of washing and spin-drying in a washing and spin-drying machine, which comprises washing the washing in a rotating drum of the machine whilst the axis of rotation of drum is substantially horizontal, slowly pivoting the axis of rotation of the drum rotating at the washing speed to a substantially vertical spin-drying position while increasing the amount of liquor in the drum, so that the washing is substantially uniformly distributed for a spin-drying operation, and thereafter spin-drying the washing by accelerating the speed of rotation of the drum.

2. A method according to Claim 1, wherein the acceleration of the rotating drum from the washing speed to the spin-drying speed is commenced at substantially the end of the pivoting of the rotational axis of the drum, the speed of the drum not going through zero during said acceleration.

3. A method according to Claim 1 or 2, wherein the liquor is drained off during acceleration of the drum.

4. A method according to Claim 1, 2 or 3, wherein the amount of liquor in the drum is substantially doubled when pivoting of the rotational axis of the drum is started.

5. A method in accordance with Claim 1, substantially as hereinbefore described with reference to the accompanying drawings.

6. A washing and spin-drying machine suitable for carrying out the method claimed in Claim 1, comprising a rotatable drum in which washing can be washed while the axis of rotation of the drum is substantially horizontal, means for slowly pivoting the axis of rotation of the drum rotating at the washing speed after washing of the washing to a substantially vertical spin-drying position, means for increasing the amount of liquor in the drum while the rotational axis of the drum is pivoted and means for thereafter spin-drying the washing by accelerating the speed of rotation of the drum.

7. A machine according to Claim 6, wherein the drum is rotatable in a housing which is pivotable therewith through at least 90° about a horizontal pivoting axis perpendicular to the axis of rotation, the rotatable drum and the housing being rigidly supported in a frame, which is pivotable about a horizontal by pendulum columns, preferably four, each having a resilient buffer suspension.

8. A machine according to Claim 6 or 7, wherein the axis of rotation of the drum is

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- capable of being pivoted downwardly from its substantially vertical position through more than 90° to facilitate unloading of the machine.
- 5 9. A machine according to Claim 8, wherein the axis of rotation of the drum is capable of being pivoted downwardly from its substantially vertical position through more than 120° to facilitate unloading of the machine.
- 10 10. A machine according to Claim 6, 7, 8 or 9, wherein the rotational axis of the drum is capable of being pivoted from its substantially vertical position through more than 270° or less than 90° to vacillate loading of the machine.
- 15 11. A machine according to Claim 10, wherein the rotational axis of the drum is capable of being pivoted from its substantially vertical position through more than 290° or
- less than 70° to vacillate loading of the machine.
12. A machine according to Claim 10 or 11, wherein an extension neck of a frame pivotably, mounted on a wall separating the loading and unloading positions of the machine, is capable of bearing on the opened loading aperture of the housing in the loading position of the machine.
- 25 13. A machine in accordance with Claim 6, substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.
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Fig.1

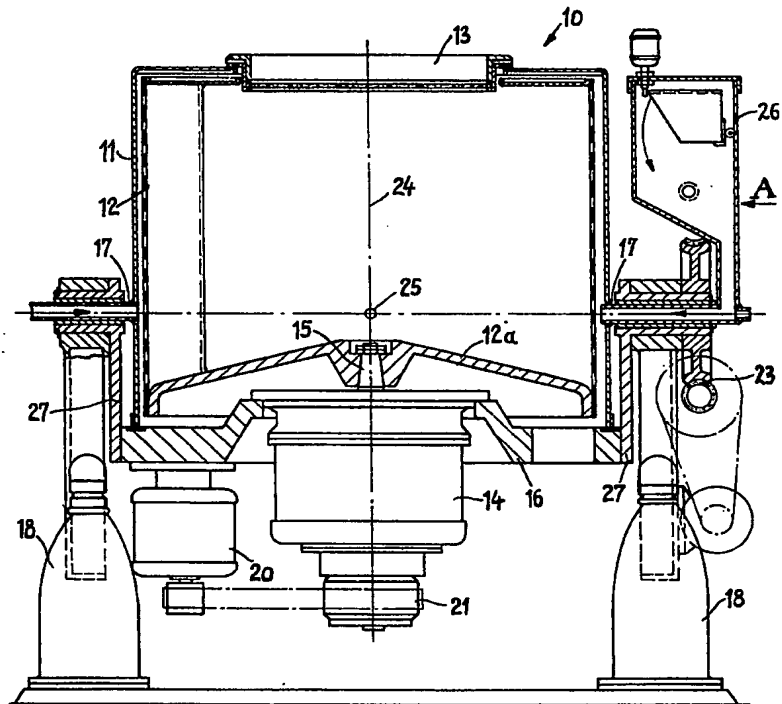


Fig. 2

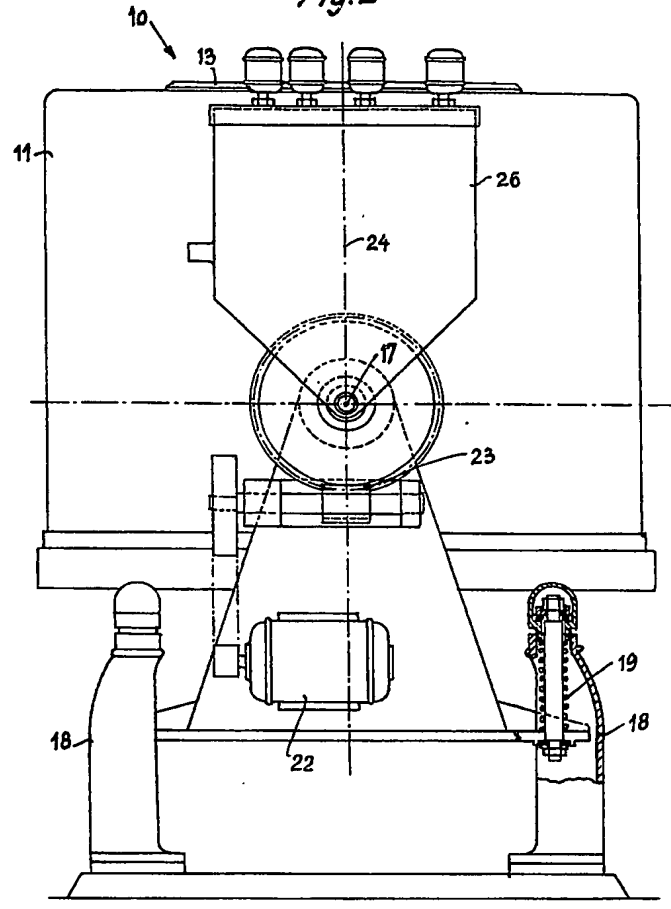


Fig.3

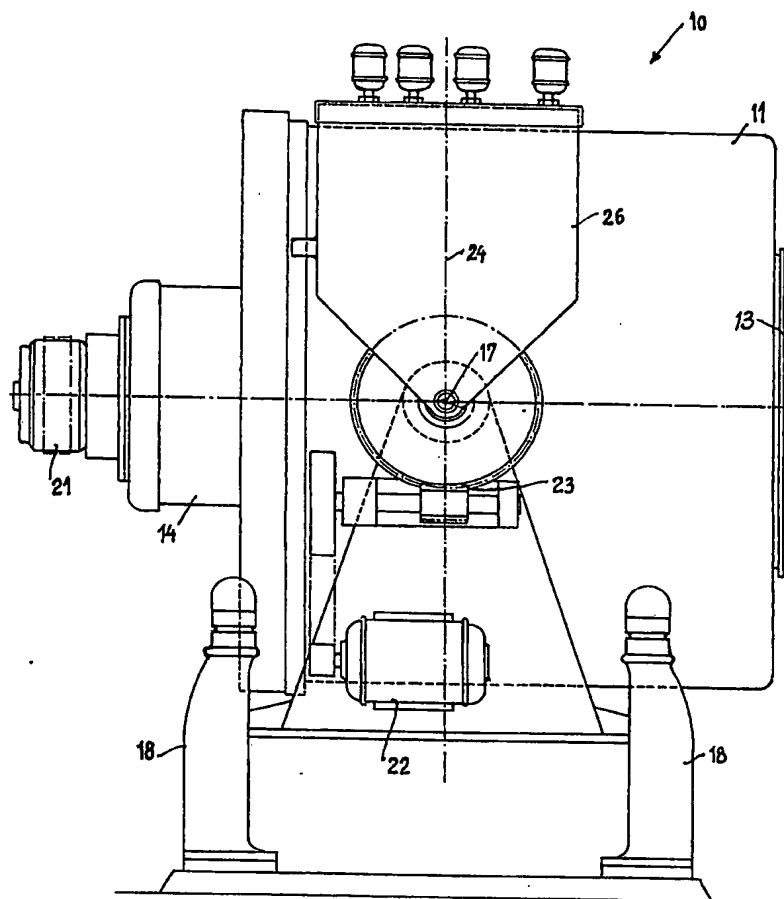


Fig.4

